CHEETAL

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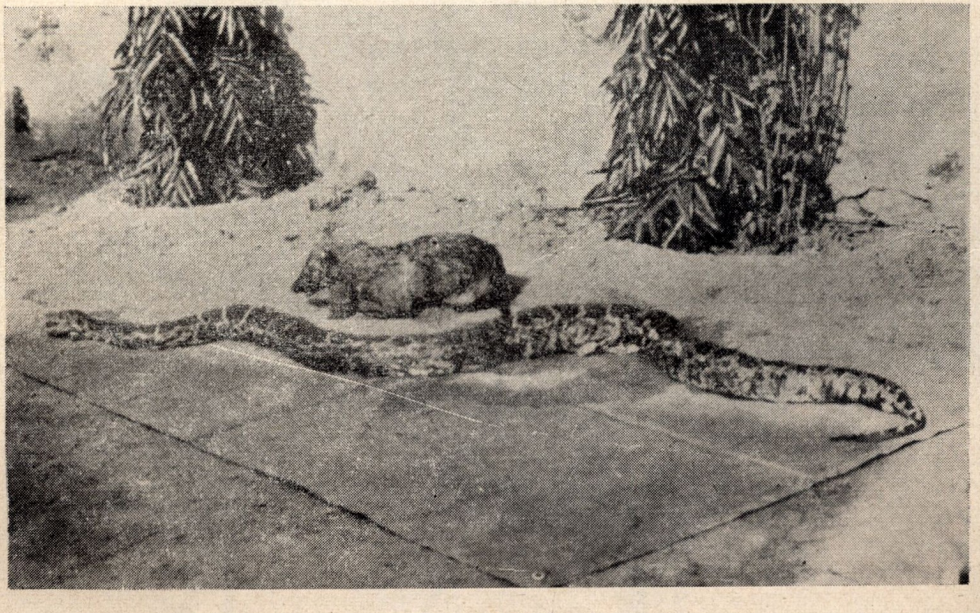
Hard Ground Barasinga in Kanha National Park. Photo—P.C. Kotwal

See Article on Page 5.



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A tree is known by the fruit it bears;

A forest is known by the animals it rears.

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(Bihar)

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Indira Gandhi—The Great Environmentalist

SAMAR SINGH

Director (Wildlife), Government of India and Member-Secretary, Indian Board for Wildlife

Indira Gandhi is no more. The world has lost one of its greatest leaders and environmentalists. To the conservation community worldwide, it is the loss of the foremost political leader and champion of their cause. This was very evident when, five days after the dastardly assassination, the 16th Session of the IUCN General Assembly, with about 900 representatives of more than 80 countries from all parts of the world, met in Madrid and mourned her death at the opening session. It was the largest gathering of conservationists held so far. They paid a fitting tribute to one who had become a legend in her own time in her efforts to promote the cause of conservation.

She was a born naturalist. In her inaugural address at the 10th General Assembly of the IUCN in Delhi exactly fifteen years ago, she said: "I have special pleasure in coming to your Conference for, if I may strike a personal note, as an only child whose childhood was invaded by the turbulence of a vast national upheaval, I found companionship and an inner peace in communion with Nature. I grew up with love for stones, no less

than trees, and for birds and animals of all kinds. I have always felt that closeness to nature helps to make one a more integrated personality".

Her concern covered all aspects of the environment because her conviction was: "One can not be truly human and civilised unless one looks upon not only all fellowmen but all creation with the eyes of a friend".

Not the least was her love and concern for birds, whether it were the peafowl in the parks of Delhi or the rare Siberian cranes on their annual visit to Keoladev Ghana, Bharatpur. Whenever anyone wrote to her about the plight of the birds in Delhi, specially peafowl, as a result of urban development activities, there was a ready response and the matter had to be looked into urgently. The peafowl in Teen Murti House, where she spent more than 16 years with her father from 1947 to 1964, always engaged her attention. Earlier this year, she wanted to know whether their roosting places were adequate and whether the population had dwindled. She was satisfied only after a special investigation was carried out and the necessary steps were taken.

It is this concern for the world of nature spanning a period of two crucial decades which accounts for the fact that New Delhi can still boast of peafowl and partridges living naturally in harmony with the fast increasing human population.

In connection with the rare Siberian cranes, an interesting episode is worth mention. In November 1983, the Non-Aligned Summit was held in Delhi and Mrs. Gandhi was unanimously elected as the Chairperson of this conference. Despite the obviously pressing duties and responsibilities in this capacity as well as playing host, Mrs. Gandhi took everyone totally by surprise by finding time to have a meeting with the President of Pakistan and the Prime Minister of Afghanistan to discuss the question of affording adequate protection to the Siberian cranes in those countries during their migration to and from India. No one had briefed her about this, it was obviously the result of her genuine interest and concern as well as her amazing capacity to manage her time. No wonder when the first Siberian crane was born in captivity at the International Crane Foundation in Baraboo, Wisconsin (USA), it was named 'Indira'.

Time management was indeed one of her many amazing attributes. She always seemed to have time for everything. Conservationists and nature lovers were always welcome to meet or write to her. When she presided over meetings of the Indian Board for Wildlife or its Standing Committee, she was most patient and heard everyone, giving an impression that nothing else mattered. As Member Secretary of the Board throughout this period, I felt guilty taking so much of her very precious time. But, she never hesitated in giving time for meetings and then participating fully.

Between 1980 and 1984, which was the period of Mrs. Gandhi's second tenure as Prime Minister, she was the Chairperson of the Indian Board for Wildlife as well as its Standing Committee. It was during this period that a number of initiatives were taken specially for the conservation of birds. An Expert Committee of the Board on Birds was established for the first time, under the chairmanship of Dr. Salim Ali, for whom Mrs. Gandhi had great respect and admiration. She called him "the father of the conservation movement in India" and the first National Award for Wildlife Conservation instituted by the Indian Board for Wildlife was presented to him in 1983 by Mrs. Gandhi herself.

It was during this four-year period that there was a phenomenal increase in the number of wildlife reserves in the country. National Parks increased from 19 in 1980 to 52 in 1984. The famous Keoladeo Ghana Bird Sanctuary at Bharatpur was made a national park and Pulicat Bird Sanctuary in South India was saved from despoliation. There are now 30 national parks and sanctuaries in India established specially for birds.

Perhaps the most notable success during this period relates to India's participation in international conventions and conferences dealing specifically with birds. India signed and ratified the Convention on Wetlands of International importance specially as Waterfowl Habitat (Ramsar Convention) and the Convention for the protection of Migratory Species of Wild Animals (Bonn Convention) at this time. This was entirely because of the support received from Mrs. Gandhi. She gave similar support to the idea of an agreement for the protection of migratory birds between India and the USSR, which was originally proposed by Dr. Salim Ali in 1971. A few days before her death, this convention was finally signed in Moscow.

Mrs. Gandhi's deep interest in birds is evident also from the following statement made by her while inaugurating the centenary celebrations of the Bombay Natural History Society in September 1983:

"The flight of birds is itself an expression of the desire to be free and to rise high above the mundane. Such natural phenomena have provided stimuli to technological innovations as well as for artistic creative genius".

Bird lovers, not alone in India but also in other parts of the world, knew that they could write to Mrs. Gandhi about their problems and get her attention. This was typical of her and this is what will be missed most by this community. Their's is a loss verily beyond repair, for there will never be another like Indira Gandhi.

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The Indian Flying Fox And The 'Coral' And The 'Floss Silk' Trees

By

S.S.R. Bennet, V.B. Sawarkar and V.K. Sood

Wildlife Institute of India, Dehra Dun

Abstract

The frugivorous Indian flying fox (*Pteropus giganteus giganteus* Brunnich) is found almost throughout India. First time in India, at Dehra Dun, it was seen feeding on the leaves of Coral tree (*Erythrina suberosa* Roxb.) and also on the nectar and anthers of the "Floss silk' tree (*Chorisia speciosa* St.-Hill), which is an exotic from Brazil. Interestingly the distribution of the flying fox and *E. suberosa* is almost the same. Litchi fruit, an exotic from China, is another very favourite food for flying fox. Obviously the plant introduction augments food sources and plays an important role in the food habits of Wildlife too. The only colony we could locate from Dehra Dun is at Mathawala Bagh. and it is very big with about ten thousand animals.

The Indian flying fox (*Pteropus giganteus giganteus* Brunnich), an arboreal species, is distributed in India, Sri Lanka and Burma (Khajuria, 1979). The diurnal roost of this bat is in the open air on trees, especially above 9 m height. Roosting sites are at the centre of human habitation and the number of animals varied from 30 to 350 in five colonies in Madhya Pradesh (Khajuria, 1971). They roost on Shisham, Tamarind, Peepal, Neem and also Bamboo clumps (Khajuria, 1971 and 1979, Brosset, 1962). This causes great nuisance to orchard owners and also to the people living near the colonies due to the loud screeching of bats. Flying fox is useful too. Flesh is eaten in many parts of the country. Regarding its medicinal use Brosset (1962) states—"Live individuals are often sold on the Bombay market as a supposed cure for rheumatism. The skin removed immediately after the animal is killed and applied to the ailing part of the human body and this, according to people who have the belief, offers an effective cure". On enquiry we were informed by an old man from Mathawala Bagh, the roosting site an Dehra Dun, that at Dehra Dun some people apply the fat of this animal, referred as oil to the affected part as an effective remedy for gout. In Kannayakumari district of Tamil Nadu, one of us (S.S.R.B.) has observed that, it is cooked and eaten or its soup is drunk as a remedy by asthmatic patients. The flying fox is helpful for the dispersal of many fruit trees (Prater 1971).

The frugivorous Indian flying fox feed on many kinds of fruits, especially Figs, Mango, Cashew, Guava and Litchi. Normally after chewing the fruits, the juice is

consumed and the remains are spat out. They are also reported to feed on flowers of Mango and the nectar from different flowers. McCann (1941) remarked that the flying fox do not visit the flowers of *Erythrina indica* and *E. stricta*.

Within the Forest Research Institute Campus, in front of the house of one of us, about 30 m away, there are two full-grown 'Coral' trees (*Erythrina suberosa* Roxb.) In the first week of July 1984, on a casual look at the trees, it appeared that the leaves at the top of the canopy were eaten by insects (defoliators). During the second week, one night around 11.00 P.M. one of us occasionally heard the shrieks of what we thought were birds. Next night also same shrieks were heard from the same direction. This raised our curiosity and the third night we planned to identify the birds which were responsible for the screeching at night. To our surprise we found about 40 flying foxes on both the trees; at intervals, some landed on the trees and some flew off. Then we directed the searchlight toward the the animals and we could observe them eating the leaves. They were using the forearms to bend the leaves which were somewhat near, but could not be reached by bending the body. After this we observed the trees regularly and we found the animals visiting the trees nightly for feeding. Some nights the number was upto 60, at a given time on both the trees.

Each night the flying foxes started coming from 8.30 onwards. Normally between 11.00 P.M. and 2.00 A.M., the maximum number of animals could be seen. When we continuously used the searchlight for more than a minute they flew away. However, during bright moonlit nights, without using a searchlight, by standing opposite to the moon and the bat in between, we could easily observe the animals feeding on the lamina. Once the bat lands on the tree it moves from one branch to another without recourse to flight unless it is disturbed by another individual. When an individual lands on the tree very close to another individual, or while feeding if one moves very close to another, usually fighting erupts. If the sky is very cloudy few bats visit the trees. However, they visit and feed normally during drizzling and even during moderate rain. At the beginning the animals attack the top of the canopy and day by day from top downward.

By the first week of August almost 50% of the leaves were eaten. On enquiry we could locate five more *E. suberosa* trees in FRI arboretum near the Guest House. On these trees also leaves bore feeding sighs. One night we confirmed that they were also being eaten by bats because we found about 25 bats feeding on them at 11.30 P.M. Even though many kinds of plants are growing densely in the arboretum, the flying foxes coming straight and land on these five trees, is a clear indication that this is a favourite food and also they remember the location which they visit regularly. By the end of second week of August about 70% of the leaves were eaten on the two trees in front of the house and it appeared as if it was due to defoliators. After that the number of animals visiting the trees decreased

gradually and from the last week of September only 5 to 10 flying foxes could be seen at a time on the two trees every night.

At Dehra Dun Litchi and Mango season ends by July. Then the Guava season begins by the end of August. These are the main fruits the flying fox is fond of in this area. Threfore, it appears that, during the intervening period, leaves of *E. suberosa* is one of its favourite feed. An incidental interesting point to note is the coincidence of the distribution of this tree and the flying fox.

There are two distinct groups of bats. One is Microchiroptera, mainly insect eating, and the other is Megachiroptera, mainly fruit eating. Some species of Microchiroptera are reported to feed on fishes, small mammals or suck the blood of large mammals while some of Megachiroptera are reported to feed on nectar and pollen (Taglianti 1979). However we could not find any literature mentioning any bat feeding on leaves. Therefore, the study of the feeding habits of Megachiroptera with reference to leaves appears important.

In the third week of September, 1984 in FRI Campus, we saw many flowers of 'Floss Silk' trees (*Chorisia speciosa* St.-Hill.) fallen from an avenue tree and lying on the road. On inspection we could see flying foxes landing on the *C. speciosa* tree. Next day, with the help of a searchlight we could see some 30 animals on the same tree sucking the nectar from flower to flower as well as munching the tip of the staminal column. When we examined many flowers fallen on the ground we could see only the upper portion of the staminal column was bitten off in some of the flowers. The flying fox would appear to be a major pollinating agent of *C. speciosa* tree at Dehra Dun. Flying foxes were not visiting the short (below 8 m) *C. speciosa* trees even though they were also in bloom. It appears that usually it feeds on trees above 8 m height. *C. speciosa* is a Brazilian ornamental flowering tree introduced to Dehra Dun probably around 1930. In America it blossoms usually from October to December (Menninger 1962). However, at Dehra Dun, it blossoms usually from August to October. After the introduction of this species at Dehra Dun this has become an additional food for flying foxes. This shows that the plant introduction may augment food sources and play an important role in the feeding habits of Wildlife too. This is also evident from the fact that in Dehra Dun district Litchi fruit is the very favourite fruit of flying fox during June-July. This Chinese tree was also introduced to Dehra Dun over a century ago.

On enquiry, we located the roosting site, Matawala Bagh, which is about 1 km away from Dehra Dun Railway Station along the Delhi road, and about 4 km, as the crow flies from F.R.I. campus. The colony is in an area of about 16 hectares of land which include orchards of Litchi, Mango etc. In September the animals were found roosting on *Eucalyptus* sp., *Grevilles robusta*, *Sterculia alata*, *Araucaria* sp., *Syzygium cumini*, *Shorea robusta*,

Cinnamomum camphora, *Terminalia arjuha* and *Mangifera indica*. The choice of trees for roosting was as follows-first *Eucalyptus* sp., second *G. robusta* and *S. alata* and the third *Araucaria* sp. In all other trees mentioned, few or very few were roosting. We were informed by a local man that during winter most of them shift from *Eucalyptus*, *Araucaria* and *Grevillea* to tall mango trees. At the entrance of this vast roosting site there is one saw mill and at the middle usually two to three band parties rehearse almost daily. We were informed that the animals normally leave the roosting site about half an hour after the sun set and return from 2 30 to 3.30 A.M. We could not locate any other colony in and around Dehra Dun. The population in this colony (1.9.1984) was about ten thousand on about 125 trees. Exact counting was not possible as the animals were moving from one tree to another or flying a little away and then coming back to the same tree. We have never seen such a big colony of flying foxes anywhere in our country.

Acknowledgements

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The Plight of Jackal

By

Raza Tehsin

41, Panchwati Udaipur-113001

A few decades back the most common wild mammal of Indian jungle was Jackal. Over 80% of Indian populace had either seen it or were familiar with its howling. There is an old saying that if a jackal started crying the sound reaches up to the Ganges i.e. the cry was answered by other jackal a few furlong away than another and so on, till the berriers of might Ganges absorb them. From this we can judge the density of its population. Jackal served us very well and still performing its duty to its utmost capacity by scavanging, by disposing off carcases and offal and hence reducing the chances of many epidemics. It prefers thin jungle and is more at ease near habitation.

In the last few decades the jackal is the only wild mammal of India which had been prosecuted for its pelt in such large numbers, lacs and lacs of jackals were very brutally killed and its voice was chocked for common man.

The area of Udaipur District is 17279 sq.km and at the beginning of 5th decade there were about 450000 jackals i.e. about 26 animals per square kilometre. Now in Udaipur District about 150 animals are left i.e. about .009 animals per square kilometre. I think the position of jackal in other districts of our country is not much better than this.

Though the Government has upgraded it and placed it in schedule I of Wildlife Protection Act. But no systematic work has so far being done to study this animal and to increase its population. It has been neglected by wildlife department of Rajasthan too. In the last census of wild animals of the game sanctuaries of southern Rajasthan this animal was excluded

In such a short period drastic reduction of its population created which type of ecological imbalance is yet to be evaluated.

As they are prone to rabbies an immediate Jehad can only save this animal otherwise the day is not far when this most popular wild animal of India will vanish from this planet.

Salient Factors on Birdslife

By

S. Subramaniam

General: By the shape of wings on the overall body profile, one can identify whether those birds are good fliers. The position of legs at the rear, the webbed toes and the characteristically efficient compact body proportions are factors from which it could be judged those are very good swimmers. The sharp beaks and the talons the keen-sighted radient eyes are parameters to identify that the possessers are birds of prey.

Body pattern and habits: Birds do bathe regularly to keep their leather and body cool and to prevent them from drying out by heat evaporation of body water contents. Water fowls and sea birds preen their feathers intermittently at several spells of the day with their bill and give them a coating of oil which is secreted by a gland called 'uropygial', located at the base of their tail. Feathers grow in well arranged oompact tracts called 'Pterylae', and the intervening spaces are called 'Apteria' both give good heat insulation. The birds never get chilled. The preening with oil facilitates the feathers impervious to water and keeping them against geeting soaked. For swimmers the tail acts as an efficient rudder and the webbed feet are used as excellent paddles. The feathers are periodically moulted and replaced by growth of fresh ones. To facilitate the bird not to loose its power of flight, the flight and tail feathers are shed in successive times. But those who shed both simultaneously go into hiding in thick vegetation lest they become easy prey to raptors. While flying they out stretch the neck with feet trailing posteriorly behind the short tail with good speed. When swimming they incert their wings at the sides of the body, closed in special pockets formed by elongated feathers.

Nesting: Many swimming birds nest in shallow depression in grass with or wihtout lining near water's edge. Sphgnum, mosses, and plant stems are used. Some burrow in ground velvetted with feathers, leaves, grass and some use rock crevices so embedded with Petrels dig their own holes, or rabbit holes or burrow rock crevices. Some make nests in open elevated spot with sea weeds, grass and bits of wood. Some build nest in trees with full of twigs etc. Gullimonts and Razorbills nests are pear-shaped. The while pelican (*Pelecanus onocrotalus*) make nest with reeds and twigs in shallow waters well amidst tangle of reeds. The Dalmatian Pelican (*Pelecanus* sp.) makes nest with flattened reeds and other vegetation in shallows. The Egret nest in bushes or on trees in forests with sticks and reeds. Flamingos nest in coastal lagoons, shallow lakes near water edge. The Whistling Bewick's Swan

(*Cygnus bewikii*) nest in swampy tundras, streams, shallow lakes with moss, lichens, vegetation beautifully lined down. The Bean Goose (*Anser fabalis*) nest in edges of lakes/rivers in moor land, and on rocky banks and bush with vegetation where they lay several clutches of eggs. White-fronted Goose (*Anser albifrons*) as a protection against arctic foxes nest in terraced hill side. Concealed spots under bushes also are selected by some geese as an ideal nesting ground, with dry leaves, grass and other vegetation the canada Goose (*Branta canadensis*) nest in coastal marshes, small Islands or in swamps. The Shelduck (*Tadorna tadorna*) use abandoned fox holes, make nest with leaves and with pieces of wood, in between piles of stones. Common Elder (*Somateria mollissima*) makes nest with twigs, leaves, seaweed and pebbles. Velvet Scoter (*Melanitta fusca*) make nest with tall grass under bushes, among rocks and pine needles. The Golden Eye *Bucephala chaugula)* make home in old nest of black wood-peckers. Merganser nests in dry land near water's edge. Sea Eagles build huge structure in tall trees cliffs edge with mass of sticks and branches. Eyr Falcon fabricates nest with willow leaves, dry grass birch twigs. Turn Stones (*Arenaria interpres*) build nest near water line with dry vegetation matter. Tropical birds build with such perfection, comparative excellence and dexterity as a season's highly skilled and refined weaver.

Food and feeding habits : The Snowy Owl (*Nyctea Scadiaca*) feeds on Lemmings and Stoats and small other birds. Puffin (*Fratercula arctica*) lives on fish, molluscs and crustaceans. Black Guillemots (*Cepphus grylle*) and Razor Bills (*Alca torda*) eat small fish, insects, molluscs and crustaceans. So also Murres (*Uria aalge* & *U. Komvia*) hunts small fish, marine worms and molluscs. Little Terns (*Sterna albifrons*) catch insects, small fish, invertebrates. Caspian Tern live on herring, also eat invertebrates, small birds and their eggs. Kittewake (*Rissa tridactyla*)feed on marine animals, fish, crustacean, molluscs and also plant food from water surfaces. Gulls, besides fish, eat larvae insects, worms etc., Cod and Herrings being their favourites. Black Necked Gull (*Larus fuscus*) eat not only fish but also small mammals and tiny birds. The Skua (*Stercorarcus skua*) feeds on worms, fish, crustaceans, Birds eggs and small mammals. Daulin, Phelaropes eat aquatic insects, larvae, flies, molluscs, crustaceans, worms and some invertebrates. Ruff eats small berries and seeds besides the above. San Piper eats small invertebrates, larvae of harlequin fly and worms. Shanks live on fish and aquatic mollusc. The Curlew eat worms, spiders, insects, small tadpoles and also green plant parts, berries and seeds. The Golden Plower (*Pluvialis apricaria*) live on small invertebrates. Tropical birds eat grains seed, fruits and berries etc. besides insects. Kites, vultures pray on mice, rodents, rats, land and water snakes, frogs and small mammals and any flesh bits of dead animals, carrion etc.

Migration: Three basic groups viz. (i) Resident birds, (ii) Dispersive birds and (iii) Migratory birds are formed depending on whether the bird group remain in their

breeding grounds all through the year or leave for winter. Those that never leave the general area of their nesting grounds are 'Resident birds', 'Dispersive birds' are those that travel far afield of hundred of kilometres in all directions from their nesting grouud after the breeding season. 'Migratory birds' are those that leave their nesting grounds each year in the autumn, fly in a specific direction to warmer quarters for the winter and return again in the spring.

Birds migrate mostly by night under cover of darkness. This applies to not only nocturnal but also many diurnal species as well. Some swim parts of the way to wintering grounds and fly the rest. Those that migrate chiefly by night are insectivorus.

Swallows, Swifts, Bee-eaters, storks and many diurnal raptors migrate in day time. Common Tern (*Sterna oirundo*) flies as fas as 10s000 km from its nesting grounds to winter quarters.

Sense of direction: Sense of direction is attributed to birds making use of direction of sun, stars, moon, landscape, earth's eclipsing axis, instinct to travel etc. for warmth. They follow a specific route with intermittant halts for reft and forage.

Breeding: The bird that incubetes is more soberly coloured so as to escape the notes of enemies. In some cases male birds incubates the eggs without aid from their mate.

A Note on Python Molurus (Linnaeus) Collected

From Tulu Village, Berhampur, Orissa

D. Venkateswara Rao and S.C. Nahar

Estuarine Biological Station, Zoological Survey of India

Berhampur (GM) Orissa-5

One of the second largest and heftiest Indian snakes is Indian Rock Python, *Python molurus* (Linnaeus). This snake is reported to be reluctant to move far and established a territory and favoured residence (Whitaker, 1982). After a heavy meal it becomes sluggish and stops moving for weeks until the digestion is completed. Though it is a lethargic snake, it becomes active at night on seeing the prey (Deoras, 1970). It strangulates its victim with the coils of its heavy muscular body. The length of the snake has been reported to be 2.5 to 4.5 metres. The maximum recorded length is 7 metres and weight 85 kgs. (Tikader, 1983).

The present paper deals with one python which has been recently collected on date 27.7.1984 by the villagers from Tulu village near Konishi, 35 kms. away from Berhampur, District Gangam Orissa. The snake has been found swallowing one Indian fox. Many stories about the cleverness and cunningness of the fox are heard but the poor fox has been caught and about to be swallowed by python. In the wild, otters and jackals are reported python's main enemies (Acharjyo and Dash, 1984). The anterior portion of the fox had been completely swallowed while the hinder portion, only the hindlimbs are left to be swallowed. Unfortunately the snake had been killed by the local villagers near paddy fields a hilly area with scrub jungle. The specimen had been brought to Zoological Survey of India, Berhampur. The fox was been taken out from the mouth of the snake and both have been preserved in Formalin. The fox measures from the tip of the snout to the body end 80 cm, tail 25.5 cm, limbs slender, tip of the tail black, body brownish grey.

After thorough examination the snake has been identified as *Python molurus* (Linnaeus) belonging to family Boidae (Fig. 1). Similarly the fox is identified as *Vulpes bengalesis* (Shaw).

The details of our observations, of the python are as follows:-

Body length	:	3.66 m
Maximum girth of the thickest	:	42 cm

Tail length	:	41.5 cm
Approx. weight	:	48 kgs
Body scales	:	68 rows
Ventrals	:	262
Caudals	:	98

Body with smooth scales, lance-shaped head and short pointed tail marbled with yellow and black body colour, brown above with rhomboid dark, grey edlanced spots, a lance shaped mark on the top of the head extending past the angle of the mouth. Head scales prominent, 11 supralabials, the first two are full of pits, the 6th and 7th touching the eye. Infralabials 16, parietal, loreal and temporal regions are covered with irregular scales.

The snake is a female one and the 'spurs' which are vestigial limbs on either side of the anal vent, are smaller.

The Python is found in India, Bangladesh, Pakistan and Sri Lanka. It is found in estuarine mangrove forests, arid scrub jungle and the cool dense rain forest areas.

Present status and some suggestions:

Pythons are killed in most of the parts of its range for the fine quality of skin. Hence the magnificient snake is now locally extinct in many areas. Their population has declined to an alarming level and they are at the verge of extinction due to illegal international trade in its skin. Its marvellous skin has a very high demand in the World market for making scarfs, belts, shoes, hand bags, wallets, purse, comb cases, cigaratte cases, tobacco pouches, caps, neck ties, lamp shades, book covers, knife case etc. At the Institute Butantan in Sao Paulo, Brazil, Library books are bound in Snake skin.

In some countries like China and Burma pythons are taken as food. Even in U.S.A. and certain western countries, python steak is served as a special delicious dish in many restaurants. Some tribes in Madhya Pradesh, Kerala and Tamil Nadu use python meat as well as fat for purported medical uses.

Except for its protection in Sanctuaries and National Parks, it has become extremely rare elsewhere. It is protected under schedule I of the Indian Wildlife (Protection) Act, 1972, and under Appendix I of the CITIS.

Under the "Man and Biosphere" programme our aim is to preserve the "totality of life" in a specified area, hence the snakes like python and other rare species may be given full protection and safer corner to continue their existence. Otherwise they will be completely extinct and future generations will only hear about these snakes and will see some snakes only preserved in scientific organisations.

As the python thrives in Estuarine belt, rain forest areas and scrub jungle, Orissa may be favourable and ideal place for its existence. The people should be very conscious in checking the illicit killing of these snakes. They should not encourage the tribals and snake charmers in killing them for mere fun. Government of Orissa should keep a strict vigil over the illicit poaching of these rare and fascinating snakes because they are extremely valuable predators on agricultural pests.

Acknowledgement

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Valley of Flowers National Park (India)

An Exploratory Survey of Habitat, Recreational Use and Resource Ecology

O.P. KANDARI

Senior Research Fellow, Institute of Himalayan Studies and Regional Development, Garhwal University, Srinagar (Garhwal)

Above the tree line, the high altitude valleys, scree slopes, marshes and morains, and, meadows and pastures all along the mighty Himalayan range, present a spectacular display of flowers during the summer months. However, nothing compares to Garhwal's unique rock garden, the world famous 'VALLEY OF FLOWERS', which is endowed with a most fabulous and rich variety of flowering herbs.

According to legends, the Valley of Flowers has been associated mythically with the name of HANUMAN, the legendary hero of the RAMAYANA. He is believed to have procured SANJEEVANI BOOTI (a mythical life saving herb) from here, to save the life of LAXMANA. Laxmana himself is said to have meditated on the shores of the famous Hemkund lake, where a tiny temple of him still stands besides the on-coming massive Hemkund Gurudwara of Sikhs[1].

Of course, the local people have long been aware of this unique monument[2] of nature, but it was brought to limelight by Frank S. Smythe, a British naturalist and mountaineer, in 1931, when after scaling the Kamet peak, he descended down in the Valley just by chance[3]. Smythe was so enamoured of its charm that he revisited the Valley in 1936, explored it extensively and published a fascinating book, 'The Valley of Flowers'. Smythe's work was ably assisted by England's eminent botanist a Life Member of Wildlife Preservation Society of India and Editor "Cheetal" R.L. Holdsworth. In furtherance of Smythe's study, John Marget Legg went to the Valley in 1939, but unfortunately lost her life there.

Once explored, the Valley gradually caught the attention of the naturalists, researchers and trekkers from the worldover. Unfortunately, the unplanned display of this spectacular natural monument proved disastrous, which affected the sensitive ecosystem adversely. Later, to protect and conserve this heritage, the Valley and its environ was declared a national park, on November 6, 1982[4].

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1 — The Hemkund lake is situated on the south western periphery of the Valley of Flowers National Park.

2 — For long the local people could not dare to enter the Valley because of certain superstition that anybody going there may be carried away by the fairies residing there.

3 — According to Ahluwalia (1982), Col. Edmand Smythe, also an European, was the first foreigner to explore the Valley, who visited as early as in 1850

4 — Under the Govt. Notification No. 4778/14.3.66/80, dated 6.11.1982.

PARK AREA :

One of the youngest and also the smallest national parks of the country, this high altitude reserve is situated in the north eastern part of the Garhwal Himalaya, occupying the upper catchment of the Bhyundar ganga—a tributary of the river Alaknanda. The Park ecompasses an area of 87.5 km^2, which extends between north latitude 30°42′ and 30°48′, and east longitude 79°33′ and 79°42′. The entire park area falls under Badrinath Forest Division in Chamoli district. The Park boundary is generally demarcated by high ridges with an average height of about 5500 m[5].

Altitude inside the Park ranges from 3050 m to 6590 m, the highest point being the top of Nar Parvat. The topography is highly rugged and mountainous comprising of snow peaks, glaciers, deep gorges, and of course, the lush green alpine slopes. The Park is dissected by numerous streams and waterfalls, however, river Pushpawati is the lone river inside the reserve. The Pushpawati emerges from the huge Tipra glacier, flows right across the park in its western part and then turns abruptly towards south. After flowing through a deep gorge in the southern part of the Park, the river ultimately comes out of the Park to meet with the Laxmana ganga[6] below Ghangria. Beyond Ghangria, the river takes its name as the Bhyundar ganga till it merges with the Alaknanda at Govindghat.

The Valley of Flowers itself is positioned in the south western part of the Park. A flattish Valley, it is about 3.5 km long and 2 km wide. Beginning at at an elevation of 3500 m, the valley gradually slopes-up like a winding corridor to 3900 m.

APPROACH :

Govindghat, a small hamlet, situated at the confluence of the river Alaknanda and the Bhyundar ganga, at a distance of 22 km from Joshimath on Joshimath Badrinath road, is the last motor head to the Valley of Flowers National Park. A further 15 km briddle path beyond Govindghat, via Pulna and Bhyundar villages leads to Ghangria, the last out-post to the Valley. The Valley is at a distance of 4.5 km from Ghangria.

Considering the ideal weather conditions and the flowering season, mid July to mid August is the best time to visit the Park. The weather, particularly in the Valley is very uncertain. Normally, mornings are very clear and bright but by 11 a.m. dense fog starts funneling up the gorge. The Valley seems to be literally sucking in the fog, which swirls-up and sweeps-down the entire Valley in the afternoons, generally followed by prolonged rain.

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5 — The Park boundary runs through the ridges connecting Khulia Ghata. Nilgiri, and Ratban peaks in north east, Ratban to Gauri Parvat in east, Water divides between Gauri Parvat and Pushpawati Valley passing through Hemkund to Khuntkhal pass in South, and the ridge between Khuntkhal in the West.

6 — Laxamana ganga emerges from the Hemkund lake.

TOURIST ATTRACTIONS :

The Flora :

Amazing cycles of growth, their mosaic of colours, the rhythm of their occurence and peculiar distribution of the unique high altitude flowering plants have all made the Valley of Flowers and its environ a favourite destination of the tourists and the plant scientists. The Valley begins to witness the early florwering as soon as the snow starts melting, generally during mid May. The dwarf Rhododendron is among first to flower. Simultaneously, species of *Primula, Gentiana, Oxygraphis, Ranunculus, Caltha, Anemone and Fritillaria* etc. begin to peep out of the ledges and cranines. From the first week of June the Valley begins to be densely carpetted with flowers. The flowering brusts forth miraculously to its full blossom between mid July and mid August. With the advent of September the colours begin to fade away. However, quite a few plants may be seen flowering at the end of season, i.e., during the last week of October to first week of November. Most of these plants are the early flowering varieties which reflower during the closing of the season. Thenceforth, snow begins to cover the landscape and the tender floral beauty. Virtually, the entire season of the Valley of Flowers, i.e., mid June to September, shows a very interesting succession of the flowering patterns. The nature keeps on changing the floral composition till the autumn bids farewell to the flowers. This periodical change in flowering results in appearance of a fabulously matted Valley floor with blue, violet, red, pink, crimson, yellow and white colours during the different months of the favourable season. No less interesting is the distribution and dominance of different flowering plants in different reaches, which is greatly affected by the elevation and the ground composition.

So far, Smythe (1932, 1938) has come forward with the first hand and also the most eomprehensive information on the plant communities of the valley. He has reported as many as 250 species of flowering plants from the valley and its environ. To mention some of the common and more interesting plant genera from the valley are, *Aconitum, Anemone, Delphinium, Meconopsis, Corvdolis, Viola, Stellaria, Geranium, Potentilla, Saxifraga, Sedum, Anaphalis, Cyananthus, Primula, Gentiana, Cynoglossum, Artemsia, Pedicularis, Aster, Polygonum, Iris, Fritillaria, Nomochris* and the like.

Interestingly, most of the flowering herbs in the Valley have medicinal, and commercial value as well. To mention some of the economically more important plants *Aconitum belfourii* (Mitha Bish), *A. haterophyllum* (Atis), *Potentilla fulgans* (Bajradanti), *Bergenia strachei* (Pakhan Bedh), *Selinum veginatum* (Bhootkeshi), *Nardostachis jatamansi* (Jatamansi or Masi), *Picrorhiza kurrooa* (Karui or Katuki). *Polygouum macrophyllum*

(Kukhri), *P. rumcifolium* (Kanthla), *Orchis latiafolia* (Hathajori), *Allium stracheyi* (Pharan) and the like. *Saussuria obvalata* (Brahm Kamal), an aromatic herb largely used in the religious ceremonies, particularly in the Shiva Shrines, normally grows above 4000 m; the vicinity of Hemkund lake being the best habitat.

The Fauna :

Not much is known of the fauna of the Valley of Flowers National Park. However, depending on the reports of the villagers and the forest and wildlife officials as also the observations of the present author, it could be established that most of the high altitude fauna found in Garhwal is found in the Park, though having rather a poor distribution.

Among the mammals, the cat family is represented by Jungle Cat ((*Felis chaus affinis*)), Leopard Cat (*F. bengalensis*), and Leopard (*Panthera pardus*). Presence of Snow Leopord (*P. unica*), is however, yet to be confirmed. Presence of both the Himalayan Black Bear (*Selenarctos thibeianus*) and the Brown Bear (*Ursus arctos isabellinus* has been witnessed by the author. Of the family Canidae, so far, only Jackal (*Canis aureus*) and Red Fox (*Vulpes vulpes*) have been reported from the area. The only Known representative of the family Mustelidae from the Park is Common Ottor (*Ltura lutra monticola*). Order Artiodactyla is represented by the bovines like Serow (*Capricornis sumatraensis*), Goral (*Nemorhaedus goral*), Tahr (*Hemitragus jemlahicus*) and Bharal (*Pseudois nayaur*), while from among the cervines, Sambar (*Cervus unicolor*), Barking Deer (*Muntiacus muntjack*) and Musk Deer (*Moschus moschiferus*) have been reported. Indian porcupine (*Hystrix indica*) has also been reported but only in the lower reaches of the Park.

Among the avifauna, the game birds like partridges, pheasants and quails and the raptor birds like vultures, eagles, falcons and kites are generally rare in the Park. However, a variety of pigeons, doves, cuckoos, kingfishers, bee eaters, barbets, wood peckers, swifts, orioles, minivets, bulbuls, flycatchers, Babblers, laughing thrushes, nuthatches, finches and the like birds enjoy comparatively a rich distribution in the Park vicinity.

Among other fauna type, the Park, particularly, the Valley harbouns a variety of colourful butterflies during the flowering season.

With all its bewildering floral spectrum, primitive wilderness in some parts, variety of faunatype (specially the birds and butterflies), and the thrilling land architecture, the Valley of Flowers National Park is a virtual paradise for the naturalists, plant scientists, wildlifers, trekkers, mountaineers and all other nature lovers. Broadly speaking, the entire Bhyundar Basin is a land of great interest, beauty and visual quality. All along the Valley trek one always comes across some breath taking scenery. Govindghat, the entry point to

the Valley, situated at the confluence of the Bhyundar ganga and Alaknanda, is itself a spectacular settlement. Beyond Govindghat, thc Valley trek follows the Bhyundar ganga. The gradient of the river is very steep, the flow obviously is very fast and thus the fog generated by the churned water beating against the massive boulders is wafted far and wide. At places where the trek is close to the river, its cool touch mops the sweat beads and drains away the fatigue. There are several waterfalls all along the way, eagerly descending down to meet the Bhyundar ganga. All the time one is passing through beautiful forests of Maple (*Acer caesium*), Walnut (*Juglans regia*), Mulberry (*Morus alba*), Poplar (*Populus ciliata*), Alder (*Alnus nepalensis*), Horse Chestnut (*Aesculus indica*), and/or Rhododendron (*Rhododendron arboreum*). The vegetation changes till Ghangria, where attractive, tall and elderly trees of Himalayan Fir (*Abies pindrow*), welcome the visitors. Pulna and Bhyundar villages are the two typical settlements enroute which present colourful spectrum of the local culture. To enjoy the traditional *Chattis* (Challets) is all the more, an unique experience. Kag Bhushandi and Hemkund Lokpal are the two other important tourist attractions of the Bhyundar basin. A 30 km wilderness trail bifurcates from the Valley trek at Bhyundar village to lead to the massive, beautiful and mysterious Kag Bhushandi lake. Again, a 5.5 km trek bifurcates from the Valley trek near Ghangria to lead to the Hemkund Lokpal. Hemkund is one of the most sacred Sikh shrines, only second to the famous Golden Temple of Amritsar. The massive and beautifully developed Gurudwara at the shores of the Hemkund lake, at an altitude of about 4420 m, is no less than a wonder to the visitors, symbolising the religious sentiments, integrity and hardworking character of the Sikh community.

TOURIST TRAFFIC TO THE VALLEY :

Smythe's account gave a wide publicity to the Valley of Flowers. However, the Valley could catch the world market only after 1974, when the tourist inner line in the Himalaya was opened. Today, the Valley has come up as a big promise for touristic sale. Incidentally, the Valley falls in the area of Badrinath, the famous Hindu *Dhama*, as also, the Sikh's famous pilgrim resort of Hemkund is close to it; it has promoted the inflow of a sizeable number of domestic tourists. It is largely because both the shrines open up around mid May and the pilgrim traffic attains peak during June-September, thus coinsiding with the flowering cycles in the Valley. Researchers and also large groups of the college students from all parts of the country visit the Valley in good number. Availibility of road transport up to Govindghat, and good accommodation facilites provided at Govindghat, Ghangoria and Hemkund have also played a key role in increasing the tourist traffic to the area. Accommodation provided by the Garhwal Mandal Vikas Nigam (GMVN*) and their package tours have further brightened the prospects of high spending class.

* Garhwal Regional Development Corporation, a Govt. of Uttar Pradesh undertaking.

Reliable data on Valley visitation are so far lacking[7]. Survey carried out by Regional Tourist Office, Pauri, revealed that the total tourist traffic to the Valley of Flowers and Hemkund has been 24,189 tourists in 1981, 36,000 in 1982 and, 48170 in 1983. It shows almost 99% growth over two years.

HUMAN IMPACTS :

Human activities in the past few years have caused disastrous ecological crisis in the Valley. Traditional herdsmen with their livestock were first to encroach the Valley environ. Subsequntly, poachers and herb gatherers also became active. The malady was further aggravated when the Valley was opened for the tourists without fixing suitable norms and policies. Visitors found their access possible by ruthless trampling and plucking of the tender plants. Many of them preferred to camp well in the core of the Valley. Ponies hired by the tourists were free to graze in the vicinity. The excreta of the domestic livestock and the biodegradable and non-biodegradable debris thrown by the tourists obviously have had some impact on soil constitution apart from creating ugly sight.

Later, considering the deteriorating Valley ecology, herb collection, entry of ponies, camping inside the Valley and grazing were banned, however, indiscriminate trampling and plucking of the flowers still continues as in the past. Regrettably, even after imposition of ban on the various unwanted activities, this author in 1981, observed two temporary helipads constructed so as to facilitate the visit of a dignitary. With all these effects the flora of the Valley had suffered for the worst. The flowering in the Valley has already began to witness a gradual decrease each year. For the last few years a striking change in the floral composition is being observed and some plants, particulary *Polygonum alpinum*, are steadily dominating the scene, thus preventing the growth of other plants. The weed like growth of these plants has already taken a sizeable part of the Valley floor and is likely to cover the entire scene if the present trend continues. The exact cause of the immense growth of these plants is yet to be explored, whether it is natural successional process or is initiated by man's actions. Some ecologists attribute it to the restriction imposed on grazing, while others are of the view that it is because of the enormous accumulation of excreta of the livestock and the debris, which might had changed the soil constitution. In time, if the present trends go unchecked, the fascinating Valley of Flowers would one day cease to awaken to its visual spectrum of beauty. Fauna of the park too is fighting a desperate battle of survival because of the indiscriminate poaching and the competition with the livestock, in the past. Poaching activities could not be totally curbed down even after the declaration of the area as a national park.

7—Now a checkpost has been established by the Park authorities at Ghangria, so as to restrict the unauthorised entries. It will also help in determining the pattern of tourists traffic in the Park in future.

This author has come to know that now the activities of the massive Vishnu Prayag Hydel Project are proposed to be extended to the upper catchment of the river Bhyundar, so that the water of the river could be utilised for power generation. In case such a plan materialises, there is every possibility that it may cause severe and irreparable loss to the park ecosystem.

NEED FOR A POLICY :

Declaration of the Valley of Flowers National Park has been indeed the most appropriate step taken towards the continued protection and conservation of the Valley ecosystem. It has been widely welcomed by the naturalists and the environmental scientists. In fact, for long, the Valley has been awaiting for such a step. However, it has been a sad paradox, that the park has failed in the implantation of an effective interpretation programme. To put it otherwise, the park has, so far, largely remained in the blue prints, still starving for the appropriate planning strategies.

Considering the sensitive high altitude ecosystems of the park in general and the deteriorating Valley ecosystem in particular,there is an urgent need for formulating suitable development plan and policy for the park. Since the area has already lost much of its natural assets, the first and foremost need of the time is the restoration of the health of the degraded habitats. To meet this objective, it is essential to carry out indepth studies on the flora, fauna and other park resources. These studies should be collected, mapped, assessed and monitored periodically, which will help in determining the status of the park ecosystems and the changes taking place thereupon. These findings would ultimately help in chalking out suitable protection/conservation measures. Appropriate park zonation, strict enforcement of the laws and above all people's active involvement are the essential prerequisites of effective park planning.

There are views that to save the Valley environment from the further deacy it should be altogether closed for the tourists. Of course, unplanned or badly planned tourists activities have disastrous impacts but then to stop the tourist activities is not the solution. Since, it would not be appropriate to devoid the humanity from enjoying such unique natural assets nor is it possible to close much of the such areas (specially in hills where the ecosystems are always sensitive and fragile), without any land use for the conservation purpose alone. Instead, the non-consumptive tourist activities if wisely planned, can play an effective role in park development. In fact, in the recent years, the non-consumptive tourist activities, together with an appreciation and elusive economic returns, have played a significant role in the spread of the conservation ethics by encouraging the establishment of the parks and equivalent reserves the world over. Tourism in the parks, specially in the East African

countries has come forward as the best alternate landuse of the park areas and is also playing a significant role in their national economy and in earning the foreign exchange. Thus, tourism oriented conservation strategy is the best possible way of park development, particularly in the developing countries, where otherwise, it would be difficult to justify the scarce revenue on the system of the parks and equivalent reserves. Putting these facts on a broader base, tourism and conservation are abstractions that have greater total impact and interdependecies, since, tourism interests complement the conservation efforts while conservation ideology and practice fosters tourism and recreation. Tourists and conservationists virtually share a common perspective, since, the variety and richness of the resources and their maintenance is equally appreciated and encouraged by them both.

The Valley of Flowers, National Park enjoys an ideal tourist magnetic environment, where tourism can successfully forge its way. Virtually, tourism is needed for the park development itself as also for the development of this otherwise economically backward region. However, tourism should be developed within the carrying capacity of the park and not at the cost of the park resources. This objective can be achieved when planning of conservation and tourism is done on an integrated mountain development approach which should not only ensure wise resource use and judicious management but also people's participation. Without their co-operation any conservation/recreation programme would defeat its purpose.

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IMPORTANCE OF MINIMUM SAFE DISTANCE IN BEHAVIOURAL STUDY OF GAUR

By

DEB PRASAD GUIN AND BIKAS CHANDRA PAL

Ecology, Behaviour and Wildlife Unit, Centre for Life Sciences, University of North Bengal, P.O. North Bengal University, District Darjeeling, Pin 734430, West Bengal (India)

Introduction

Some preliminary knowledge regarding the minimum safe distance (MSD), which the investigator must maintain between himself and the animal under investigation is of paramount importance not only because it will help him to get close enough to the animal for detailed observation but also because it will help him not to disturb the animal. Once the animal is disturbed at least its normal behaviour will be lost even if it does not resort to fleeing or attacking and as such continuous observation will not be possible.

Total perceptive capacity or alertness and degree of human exposure of the animals are important factors in considering MSD. Degree of dependence on particular sense organ varies among different species and depends on its habitat, structural ability to flee or face the adversary and some other relevant behaviour patterns. Besides, MSD will depend on age and sex of the animal, time of the day, season and on various other behvioural and spatial contexts.

Gaur, the Indian bison (*Bos gaurus* H Smith) are found in Garumara from November to June (Guin and Pal, 1982). They live in herds although dyads and lone bulls are not uncommon. They are the largest bovine in the world having a handsome physique (Gee, 1964: Shahi, 1977). Contrary to popular belief gaurs are generally very shy and timid animals and usually try to avoid human beings. Bulls accompanying estrous cows in rut and wounded ones, however, may be highly aggressive. The present paper, part of a broader study, attends to analysis MSD under various situations.

Material and Methods

The study was carried out in Garumara Wild Life Sanctuary (26°46′ and 88°50′ E), West Bengal. The detail forest type was mentioned in our earlier publication (Guin and Pal, 1982). In short, the sanctuary (8.63 km^2) consists of moist tropical and riverain forest with sal (*Shorea robusta*) canopy and grassland having scattered sissoo (*Dalbergia sissoo*), Siris (*Albizzia procera*), etc. Most of the work was performed in the grassland habitat.

Observations were made both from ground and tree. Machans were built on selected trees. The distances from where an individual animal spotted the observer and felt disturbed were measured. The observations were made either with nacked eyes or by means of binoculars (7 × 35).

Result and Discussion

Among the three sensory cues i.e. smell, sight and hearing which inform organisms of their surroundings from a distance, sight is usually poorly developed in forest animals. In gaur which mainly feeds on grassland and retires in hard-wood forest, the sense of hearing and smell seems to be the two most important sense organs. Existence of a considerable number of distinct vocalization patterns for intraspecific communication and frequent sniffing to know its immediate environment in gaur further substantiate our idea. Schaller (1967) and Prater (1971) reported that sense of smell of gaur is acute. On many occasions it was seen that even the sound of the shutter of a camera or the sound of starting a stop-watch were perceived by the animals from 20 to 30 metres but prior to that they were totally unaware of the observer for long periods of time. These observations indicate that sense of hearing is no less important than smell. Johnsingh (1979) reported about short sightedness of bulls and greater alertness of cows. Generally cows and juveniles in the herd are more alert. The alert-posture consists of frontal orientation of the body, raising the head above the hump, pinna held slightly backwards and at right angle to the head. The tail and pinna movement is less than usual while the body remains motionless. The animal maintains this posture for 2 to 3 to even 5 minutes. When a gaur happens to encounter a human being from a distance of about 20 to 35 metre, it immediately assumes alert posture and flees away making a growling sound 'Phons-s-s-s' by blowing air along with mucous substances through

Table I

	Minimum distance for safety and behavioral observation	
Position of the observer	Observer in clear view of Gaur	Observer not in clear view of Gaur
Ground	11.3±2.6 (N=20)	42.3 (±2) (N=15)
Tree	94.6±1.9 (N=20)	8.1±0.4 (N=15)

its nose. The same activity is next performed by the member of the herd closest to the observer and the others follow suit. When a gaur spots the observer from a distance of 50 to 70 metres it lifts its head and gazes at the adversary for about 3 to 5 minutes, and frequently sniffs the air by raising the muzzel. The animal then lowers its head and moves it tracing a horizontal '∞' which indicates a typical threat display. After 3 to 5 minutes it feeds for about 3 to 5 seconds and again stares at the adversary. Investigation and feeding goes on simultaneously with gradual decrease of investigation. After a while (8-10 minutes) they leave the spot and move out of sight of the adversary.

Table 1 shows two things: (1) minimum distance for behavioural observation on gaur from the ground or tree when the observer is in clear view of gaur and (ii) minimum safe-distance that the observer must maintain between himself and gaur for observation from ground or tree when the observer is not in clear view of gaur. Thus the distances in the first series help the observer to collect data without disturbing the animal. On the other hand, the distances in the second series ensure safety of the observer. Distance records were taken during the afternoon when wind velocity was very low or negligible.

Data in Table 1 would be more applicable in case of cow-calf units and of dyads rather than herds and solitary bulls.

Johnsingh (1979) once stalked a lone bull as close as 10 metres. Similarly, one of the autors (DG) approached a lone bull and a herd of 23 within 7 metres and 10 metres respectively. These distances, however, should not be treated as safe-distance.

Concluding Remarks

Researchers on wildlife should have some knowledge regarding minimum safe distance and minimum distance for behavioural observations before undertaking actual investigation in the field. These distances although influenced by a host of factors seems to be species-specific.

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The Eagles

A. Tennyson

He Clasps the crag with crooked hands,
Close to the sun in lovely lands,
Ranged with the azure world, he stand.
The wrinkled sea beneath him crawls,
He watches from his mountains walls,
and like a thunderbolt he falls.

Composition and Behaviour of Gaur Herd in Kanha National Park

D.K. Belsare, S.C. Chandiramani and J.J. Dutta

School of Biological Sciences, Bhopal University. Bhopal

Introduction

The gaur (*Bos gaurus*) is widely distributed in the central high lands of India and their numbers are increasing in the Kanha National Park due to strict conservation measures applied ever since this park was included under the tiger project. The present study was, therefore, undertaken to provide information on composition and behaviour of gaur herds in this park. The previous reports (Brander 1923, Mustill 1938, Schaller 1967) present a broad spectrum of facts aimed at understanding the inter-relationship of various animal species in this area. The behaviour of the related subspecies such as hubbacki (Ogilvie 1954, Weigum 1971) is also reported elsewhere.

Material and Methods

The study area was the Kanha National Park which lies between 22°07′ north latitudes and 80°55′—81°03′ east longitudes. The park covers a well managed forest belt extending from the Nimar district adjoining Maharashtra to the Sarguja in the east part which adjoins the Bihar State. It also extends with small interraption as far as the Rewa district adjoining the Uttar Pradesh and to the south, the Bastar region of the Madhya Pradesh.

Most observations on the gaur herd were made with the help of visual side or by reading various signs such as tracks, trails, beds, dung heaps, urine, sign-posts, etc. left by the animals. The signs left during fights or grazing were the physical evidences of the animals' behaviour. The visual observations were made by sitting on machan using field binoculars during day time and an infra-red device during night hours. The observations were recorded on punch cards and later compiled and computed for interpretations.

Observations and Discussion

Herd composiiton

The gaur herd usually consists of adult bulls, cows, sub-adults, yearlings and calves. The males have a massive body with a high dorsal ridge and thick horns. The yearlings, which are light tan in colour, are those of the previous season's birth. The sub-adults are

two years old and darker in colour. Observations made in 1978-79 on 69 herds consisted of 397-437 individuals including 17-18 solitary bulls and herds of 65-73 bulls, 166-172 cows, 43-44 sub-adults, 40-54 yearlings and 56-86 calves. The ratio of bulls to cows is 1:2. Schaller (1967) stated that the male and female calves are equal in proportion. A probable cause for the decrease in proportion of adult males to females may have been selective predation on males or mortality from bull to bull combat. However, the herd size is not affected because of the polygamous nature of the adult male.

The most frequent herd size seems to be of 3-6 and 10 individuals. Large herds consisting of 16, 22 or 24 animals were observed once each and were probably conglomeration of smaller herds. Schaller's (1967) observations on herd size in the Kanha Park indicate that it varied from 5.5 to 10.5 animals and increased from January to May, remaining at the peak level from June to December. The maximum size of herds varied from 10 to 29 animals during the same period. It is likely that herd size is determined by the animals' defensive requirement as well as by food availability.

The solitary bulls are full grown, heavy built and often of advanced age as judged from the condition of horns. Although fights between males were noted on several occasions, they were most common during rutting season, the successful one usually drove the loser away from the herd. The latter moved away and remained in solitude or joined another herd.

Forsyth (1889) observed that very old bulls with horns were always found alone. Brander (1923) stated that the old bulls lead a solitary life and seemed to have lost sexual instinct at a comparatively early age. Schaller (1967) mentioned that the solitary bull may take up residence along a particular area for several days.

A study of faecal sample from tigers indicated that only 2.6% of the gaur fall prey to this carnivore. These samples were mostly obtained during summer, which means that the gaur were killed by tiger during the hot season when animals were concentrated near water holes of the plain.

Herd behaviour

The gaur are shy animals and run away swiftly when approached even at a distance of 300 to 400 m. The solitary bull, however, may charge instead of running. They are exceptionally alert to potential danger and respond to alarm signs from their own and other species like ungulates and monkeys with series of characteristic sound and signals. The alert posture consists of lifting the head above the level of its hump and facing the source of disturbance. The muzzle is sometimes raised as if the animal is sniffing the air. The attitude

and display are important means of expression particularly during intraspecific communications. Threatening gestures, most of which are of low intensity, consist of walking directly at the opponent perhaps with head slightly lowered and with jerks accompanied by a lateral sweep of the horns. A gentle nudge with the horn tip is usually sufficient to make a neighbouring animal move. A head-up display, resembling that of the other ungulates in the park, consists of an upward jerk of head while facing the other animal. This gesture may be followed by a threat with lowered horns. When the male gaur are involved in a tense situation, such as an approach by a higher ranking individual or at the time of courting a cow, they frequently lift their head briefly, showing a nervous gesture related to the head-up display.

When the rival bull approaches, he holds his head low with the muzzle almost touching the ground and horn tips pointed forward. At the same time he swings his head and even his forequarters from side to side. Air is blown out through the nose, emitting a spectrum of sounds from gentle sniffles to violent snorts. The bull may interrupt his approach, extend his muzzle, and give a hoarse bellow. Sometimes, he jabs a horn into a sapling with an upward swing of the head or pushes a bush down with forehead before thrashing it with his horns. The display has in most instances enough of an intimidating effect that another bull either turns aside, stands with head and neck pointing towards the ground or begins to graze. This is apparently a gesture of submission.

Sparring is observed most frequently among the adults bulls and cows and consists of touching horns gently and pushing and twisting with the head. After challenging each other with lowered horns they try to drive each back twisting their heads side ways.

The most striking behaviour pattern is a lateral display in which a bull presents its impressive profile by placing itself parallel to another one with his head lowered and back hunched. The opponent then often assumes a similar posture. One may start encircling, moving very slowly, while the other stands at one place and shifts his position to keep his broad-side towards the opponent. Bellowing and digging soil with horns may precede this display. Usually only two bulls are involved in such display but occasionally three or four may also be seen.

The lateral display appears to be one of the principal means by which bulls, particularly the mature ones establish their rank without actual physical contact. Antonius (1932) mentioned that the lateral display in gaur precedes attack, which perhaps is true in zoos where his observations were made, but under wild conditions, it functions as a substitute for fighting. Once a rank order between two bulls is establised, the sub-ordinate animal has a choice either to remain at the periphery of a herd or leave it for good. A dominant bull makes no attempt to drive the other animal from the vicinity of the herd.

Abstract

The composition and behaviour of a hard of gaur, *Bos gaurus* were observed in the Kanha National Park. The gaur herd consisted of mature bulls, cows, sub-adults, yearlings and calves. The ratio of bulls to cow was 1:2. The ratio of male and female calves was 1:1. The herd size was not affected because of the polygamous nature of the adult male. The most frequent herd size consisted of 6 to 7 individuals. At times solitary bulls which were full grown and heavy built were noticed. The gaur are exceptionally alert, respond to alarm signs immediately and disappear into thick cover. The lateral display: starring and head-up display are some of the important means of communication and expression of the animals.

Acknowledgement

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ON THE FISH FAUNA OF KAZIRANGA NATIONAL PARK, ASSAM

By

RAJ TILAK, *Zoological Survey of India, Dehra Dun,* AND J.P. SATI, *Zoological Survey of India, Shillong*

Introduction

The Eastern Regional Station of Zoological Survey of India, Shillong surveyed the fish fauna of Kaziranga National Park, Assam during the years 1964, 1972, 1974 and 1981 so that the fish wealth of the area could be known and the information be utilised for better understandsng of the problems of Wild Life of this important biosphere. Keeping in view this point, Yazdani (1976) reported 22 species of fish from the collections made during 1972. Since the total collection of fish from Kaziranga made during all the years, as mentioned above, was not studied by Yazdani (1976), the list of species of fishes prepared by him has been far from complete. In view of this fact the total collection of fishes made from Kaziranga during the following years has been studied recently and an enlarged list of fishes from the area has been prepared.

1. March, 1964, collector A.K. Mondal
2. February, 1972, collector G.M. Yazdani
3. December, 1972, collector A.K. Ghosh
4. February, 1974, collector M. Datta
5. June, 1981 collector J.P. Sati

As described by Lahan and Sonowal (1974), the Kuziranga National Park is situated between 90°5′ and 93° 40′ East and 26° 30′ and 26° 45′ North, partly in Sibsagar and partly in Nowgong districts of Assam. The area falls in the flood plains of Assam with a gradual slope from east to west. The Brahmputra river flows along its northern boundary and the river Mora Diflu along the southern barder. The Diflu and Bhengru rivers are the two tributaries of the Brahmputra and cross through the National Park. In addition to these, a large number of small streams also traverse through this area although it is also dotted with many bheels of varying magnitude. Thus, the vast riverine and lacustrine sources in the area contribute to a rich fish fauna of tremendous significance from the point of wild life and fisehries.

Systematic List

The fishes identified during this study are presented here in the classified form.

Division : Taeniopaedia
Super-order : Clupeomorpha
Order : Clupeiformes
Sub:order : Clupeoidei
Family : Clupeidae

1. *Gudusia chapra* (Hamilton)

Division : Archaeophylaces
Super-order : Osteoglossomorpha
Order : Osteoglossiformes
Sub-order : Notopteroidei
Family : Netopteridae

2. *Notopterus notopterus* (Pallas)

Division : Euteleostei
Super-order : Ostariophysi
Order : Cypriniformes
Sub-order : Cyprinoidei
Family : Cyprinidae

3. *Amblypharyngodon mola* (Hamilton)
4. *Barilius bendelisis* Hamilton
5. *Brachydanio rerio* (Hamilton)
6. *Brachydanio nigrofasciatus* (Day)
7. *Chagunius chagunio* (Hamilton)
8. *Chela laubuca* Hamilton
9. *Cirrhinus reba* (Hamilton)
10. *Crossocheilus latitus* (Hamilton)
11. *Danio devario* Hamilton
12. *Danio acquipinnatus* (McClelland)
13. *Esomus danricus* (Hamilton)

14. *Labeo bata* (Hamilton)
15. *Labeo boga* (Hamilton)
16. *Labeo calbasu* (Hamilton)
17. *Labeo dero* (Hamilton)
18. *Labeo gonius* (Hamilton)
19. *Labeo pangusia* (Hamilton)
20. *Labeo rohita* (Hamilton)
21. *Oreichthys cosuatis* (Hamilton)
22. *Puntius ambassis* (Day)
23. *Puntius chola* Hamilton
24. *Puntius conchonius* Hamilton
25. *Puntius gelius* Hamilton
26. *Puntius phutunio* Hamilton
27. *Puntius sarana* Hamilton
28. *Puntius sophore* Hamilton
29. *Puntius terio* Hamilton
30. *Puntius ticto* Hamilton
31. *Rasbora daniconius* (Hamilton)
32. *Rasbora elanga* (Hamilton)
33. *Rasbora rasbora* (Hamilton)
34. *Rohtee cotio* (Hamilton)
35. *Salmostoma bacaila* (Hamilton)

Family : Cobitidae

36. *Lepidocephalus* (*Lepidocephalichthys*) annandalei (Chaudhuri)
37. *Lepidocephalus* (*Lepidocephalichthys*) *caudofurcatus* Tilak and Husain

38. *Lepidocephalus* (*Lepidocephalichthys*) *guntea* (Hamilton)
39. *Lepidocephalus* (*Lepidocephalus*) *irrorata* (Hora)
40. *Mesonoemacheilus* (*reticulofasciatus* Singh and Banarescu
41. *Noemacheilus botia* (Hamilton)
42. *Noemacheilus montanus* (McClelland)
43. *Noemacheilus semiarmatus* Day

Order : Siluriformes

Family : Siluridae

44. *Ompok bimaculatus* (Bloch)
45. *Ompok pabda* (Hamilton)
46. *Wallago attu* (Schneider)

Family : Bagridae

47. *Batasio batasio* (Hamilton)
48. *Mystus bleekeri* (Day)
49. *Mystus cavasius* (Hamilton)
50. *Mystus vittatus* (Bloch)

Family : Clariidae

51. *Clarias batrachus* (Linnaeus)

Family : Heteropneustidae

52. *Heteropneustes fossilis* (Bloch)

Family : Sisoridae

53. *Hara jerdoni* (Day)
54. *Laguvia ribeiroi* (Hora)

Super-order : Acanthopterygii

Order : Channiformes

Super-order : Atherinomorpha

Order : Atheriniformes

Sub-order : Exocoetoidei

Family : Belonidae

55. ***Belone cancila*** (Hamilton)
Super-order : Acanthopterygii
Order : Channiformes
Family : Channidae
56. ***Channa orientalis*** (Bloch and Schneider)
57. ***Channa punctatus*** (Bloch)
Order : Perciformes
Sub-order : Percoidei
Family : Centropomidae
58. ***Chanda nama*** Hamilton
59. ***Chanda ranga*** Hamilton
Family : Nandidae
60. ***Nandus nandus*** (Hamilton)
Family : Badidae
61. ***Badis badis*** (Hamilton)
Sub-order : Gobioidei
Family : Gobiidae
62. ***Glossogobius gutum*** (Hamilton)
Sub-order : Anabantoidei
Family : Belontiidae
63. ***Colisa chuna*** (Hamilton)
64. ***Calisa fasciatus*** (Bloch and Schneider)
65. ***Colisa lalius*** (Hamilton)
Family : Anabantidae
66. ***Anabas testudineus*** (Bloch)
Sub order : Mastacembeloidei
Family : Mastacembelidae
67. ***Mastacembelus pancalus*** (Hamilton)

Remarks

Out of the 67 species listed here, 40 species are an addition for the area. ***Oreichthys cosuatis*** (Ham.) is reported from eastern India for the first time by us (Tilak and Sati, in press). Of the total species recorded from the Kaziranga National Park, 34% (viz. ***Puntius ambassis, P. conchonius, P. ticto, P. gelius, P. phutunio, P. terio, Labeo pangusia,, L. bata,***

L. dero, Cirrhinus reba, Brachydanio rerio, Noemacheilus montanus N. botia, N. semiarmatus, Mesonoemacheilus reticulofasciatus, Lepidocephalus guntea, L. caudofurcatus, L. irrorata, L annandalei, Mystus vittatus, Batasio batasio, Colisa chuna, Mastacembelus pancalus etc.) are endemic to Indian region. In this area, *L. calbasu, L. gonius, L. pangusia, L. rohita, L. bata, L. boga, L. dero, Cirrhinus reba, Chagunius chagunio, Mystus cavasius, Wallago attu, C. batachus, Heteropneustes fossilis, Channa punractatus, Notopterus notopterus* are important food fishes and form a major part of fish catches sold in the market of the area. The species of genera *Brachydanio, Chela, Esomus, Puntius, Rasbora, Salmostoma, Chanda Colisa* etc. are very useful larvivorous fishes which feed on larvae of mosquitoes and other acquatic insect larvae which are harmful to mankind and other wild life in the Park.

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Can Thieves be a Guide to Naturalist ?

By

Raja Tehsin and Nathawat

During the camp-fire chet in the jungles of Kumbhal Gadh we came to know an interesting phenomenon from some tribals of the region. They said that the livestock thieves of the region know some Mantras and with this power they produce transe in the sheeps and goats. They recite some Mantras on their chappals and place it on the ear of a goat or sheep after pulling it down on the earth. It has a magic effect and the animal remains inactive as long as their mascot is there. What they do is they stock the animal farthest from the herd boy, to a grazing flock of sheep or goat, pull down the animal, place their Chappal on the ear of the animal and go off. When the flock moves away from the spot they remove their booty.

We discussed it thoroughly and concluded that some pressure around the ear region may be responsible for this behaviour of the animals. For our experiment we chose four mammals one each from Deer and Antelope family and two Rodents. First we tried it on Four Horned Antelope (*Teraceros quadricornis*). A stone in a plastic tray was placed on the ear of the antelope, by laying it on the ground laterally and pressing its neck to the ground. Because it was difficult to place a stone on the ear so the flat plastic tray was used. The combined weight of the plastic tray and the stone was 973.5 g. The effect was beyond our expectation. The antelope became inactive and closed its eyes. It didn't try to throw the stone and seemed to be in deep sleep. The stone was placed for fifteen minutes, during this period the animal was not secured by any string. It remained innert as long as the stone was there. But as soon as the stone was removed it jumped and ran away. The same device was tried on a Guinea pig (*Cavia cobaya*) with the same result.

The old trick of tribals was repeated on Cheetal fawn (*Axis axis*) but with a slight modification. A Chappal weighing 193 g. was placed on the ear of the fawn in such a way so that it can cover orifice, pinnae and back of the head. This also put the animal to sleep.

A stone weighing 63 g. was placed on the ear of a Three striped Squirrel (*Funambulus palmarum*) and the reaction of the squirrel to this was the same as that of the cheetal.

In the case of above mentioned animals we found that a slight pressure around the ear region render them inactive but as soon as the pressure was removed they became active instantaneously. This shows that the pressure induces sleep in the animals.

Now if we look into the technique of killing by mammalian land predators, large as well as small we find a similarity in the mode of overpowering their prey. Whether the prey is seized by throat or by nape the predator always go for the upper reaches of the neck of its prey, that is near the junction of head and neck. What we found in the many kills of different predators that one of their canine always pierces near the back of the ear of its prey. During the attack when the predator closed its jaws on the throat or nape of its prey the pressure produced by its cannines around the ear region produces instant sleep to its prey. To pull down the prey running for its dear life in a sleepy state is quite easy for the persuar.

Predators know this anatomical weakness of its prey since ages. Taking advantage of this weakness very small predators can overpower more heavier animals. In nature also most of the predators are smaller than their most sought preys.

From these experiments on the above mentioned mammals we inferred that some superficial nerve passing near or around the ear region may be responsible for this behaviour of the animals. A slight pressure on this nerve may stimulate the sleeping centre of the brain inducing sleep into the animals.

Further study in this direction may be of immense help to naturalists, vets and allopathic doctors.

If the causes of this sleep inducing phenomenon is found out, it may reveal many mystries of human brain and solve many problems of Medical Science, and may minimize the human and animal sufferings.

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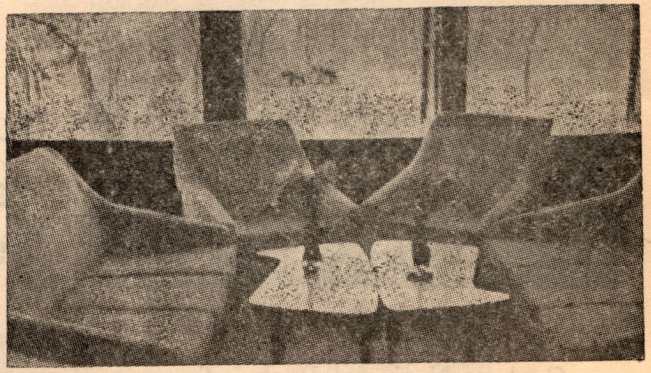

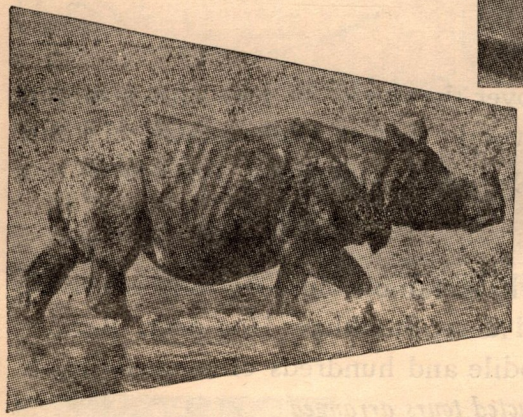

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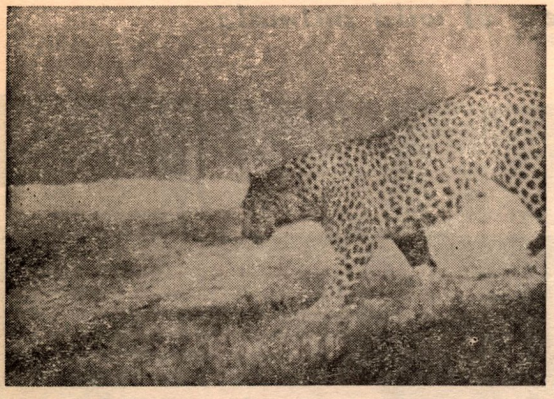

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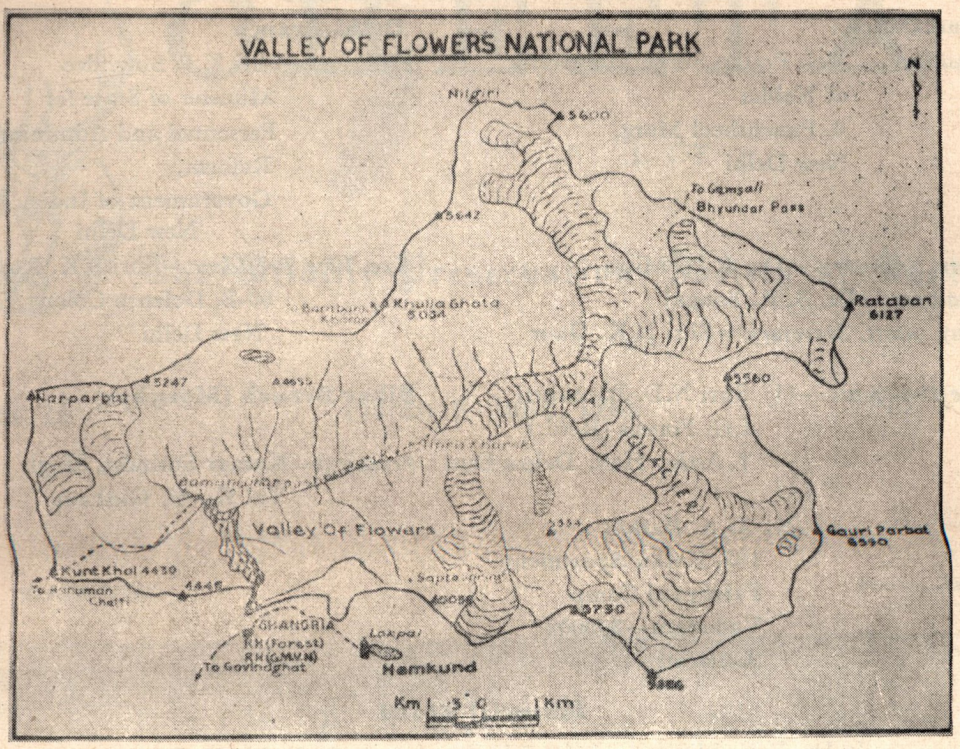

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